Space Points (and Kalman Filter) Update

LArSoft Tracking Meeting
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Outline

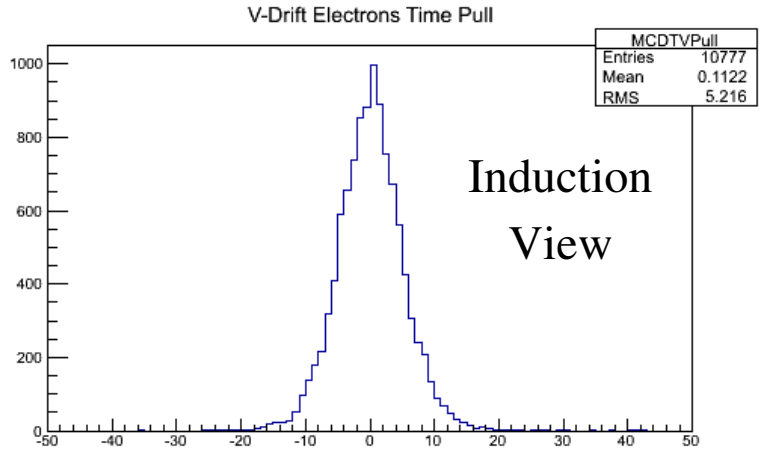
- Kalman filter updates.
- Hit resolution.
- Space points technical changes.
  - SpacePointService $\rightarrow$ SpacePointAlg.
  - Time offsets.
  - Storing space points in events.

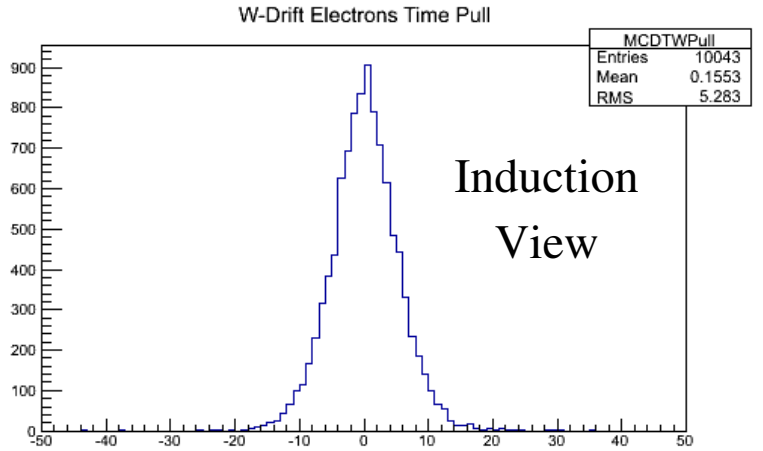
Kalman Filter Updates

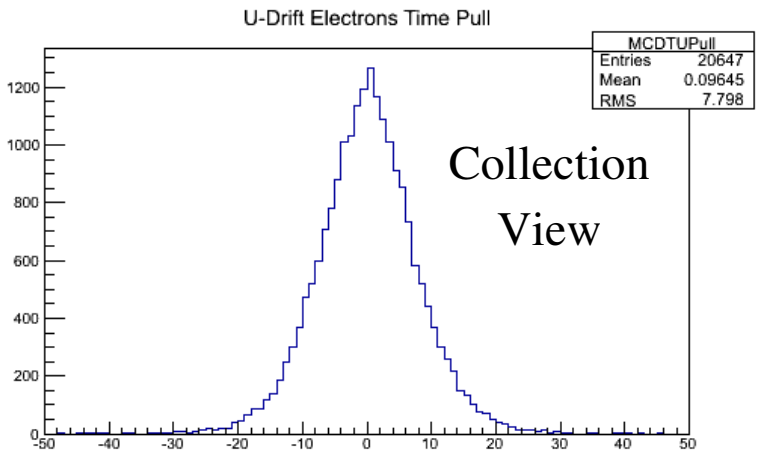
- Restricted mean energy loss calculation added in DetectprProperties service (method Eloss).
  - Kalman filter propagator now does mean *dE/dx* in base class Propagator.
- Propagation noise from multiple scattering now included also (class InteractPlane).
- With these updates it should be possible to do a Kalman filter track reconstruction and get a correct chisquare...

Hit Resolution

- I noticed Hit-based Kalman filter chisquares were unreasonably large. Add Hit reco vs. MC pull histograms in SpacePointAna.



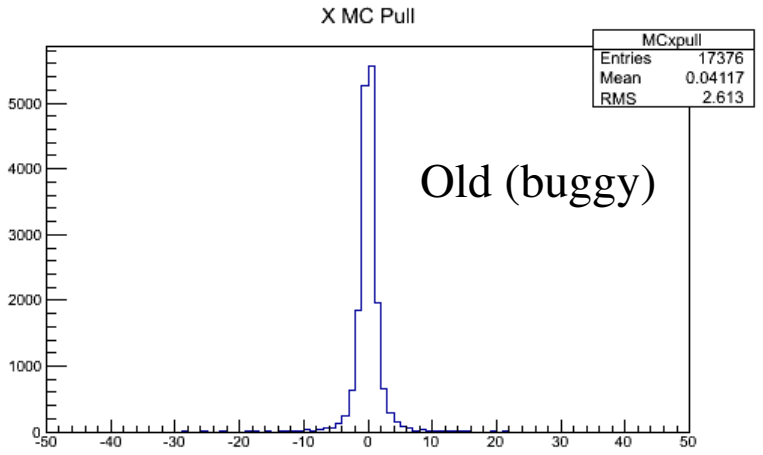


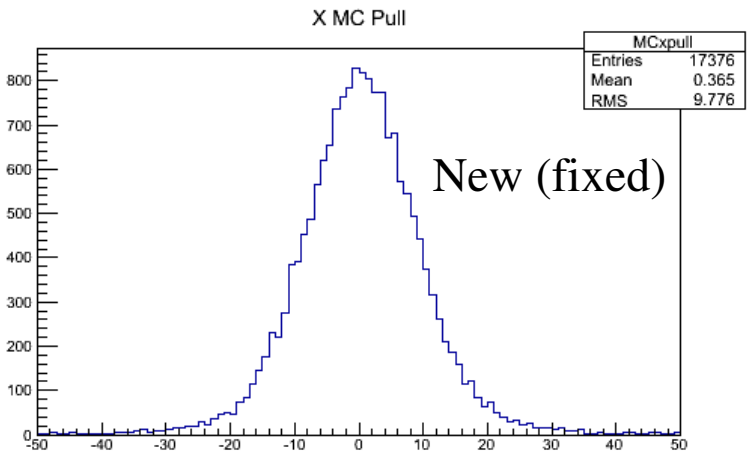


- Induction view pull RMS ~ 5.2.
- Collection view pull RMS ~ 7.8.

Hit Resolution (cont.)

- Took another look at space point *x* reco vs. MC pull (found a bug).





- *x* space point error calculation has been fixed. This means that the *x* space point error is too small by about factor of 10 now.

Space Point Algorithm Class

- SpacePointService will be converted to an algorithm class called SpacePointAlg.
  - I have done all necessary updates in TrackFinder in my test release (not committed to svn yet).
  - Effects on users.
    - Modules will have to istantiate SpacePointAlg directly (all modules in svn updated already in my test release).
    - Get rid of references to SpacePointService in job files.
    - Update overridden SpacePointService parameters in job files (default fcl parameters should be handled automatically).
    - It will be necessary to update your local test release and do a clean build.

Space Point Related Changes in DetectorProperties

- Calculation of time offsets has been moved from SpacePointService into DetectorProperties (Ben Jones).
  - Method GetXTicksOffset.
  - Other methods: GetXTicksCoefficient, ConvertXToTicks, ConvertTicksToX.
- Newly tuned residual time offsets with latest microboone electronics simulation are zero (see plots on page 4, 5):

```
microboone_detproperties.TimeOffsetU:        0.
microboone_detproperties.TimeOffsetV:        0.
microboone_detproperties.TimeOffsetW:        0.
```

Storing Space Points in Events

- A decision was reached several weeks ago by larsoft leaders and stakeholders to promote RecoBase/SpacePoint objects to first class status (able to be used as art data product).
  - Modules SpacePointFinder and SpacePointCheater will be modified to store SpacePoints and SpacePoint-Hit associations in event directly.
  - SpacePointFinder and SpacePointCheater will temporarily still store SpacePoints in Prongs (like they do now).